LESSON 4: CONTROLLING CHEMICAL HAZARDS

TRAINER'S NOTES: Introduction and Learning Objectives

Ask trainees to look at the Introduction and Learning Objectives ofpage 4-1 of their Student Workbook and emphasize the following:

- Now that you've seen the types of hazards that chemical materials present, it is time to see how these hazards are controlled.

- In this lesson, you'll see —

  - how engineering, personal protective equipment, and administrative/procedural controls help reduce the risk of injury or illness associated with chemical hazards in the workplace; and
  - how you can help to identify uncontrolled hazards in your facility.

LESSON 4: CONTROLLING CHEMICAL HAZARDS

INTRODUCTION

Everyone who works with chemical hazards needs to know how the hazards are controlled. This lesson introduces you to engineering controls, personal protective equipment, and administrative controls that may be required to protect you from chemical hazards in your workplace. Then it describes ways that you can detect uncontrolled hazards and help make your workplace safer for everyone.

LEARNING OBJECTIVES

When you have completed this lesson, you should be able to do the following

List and define three basic types of engineering controls.

Identify examples of substitution, isolation, and ventilation controls.

Distinguish between general and local exhaust ventilation.

Define personal protective equipment and identify limitations that apply to its use.

Match types of Personal Protective Equipment (PPE) with types of physical hazards or exposure hazards.

List and identify four basic types of administrative controls.

List and recognize four common ways that workers can identify uncontrolled chemical hazards.

STUDENT WORKBOOK PAGE: 4-1

TRAINER'S NOTES: Learning Resources

Videotape Segment 4A is located on Tape 1.
Videotape Segment 4B is located on Tape 2.

Note: ***On VHS or BETA videotapes, all seven segments are on one videotape.***

TRAINER'S NOTES: Directions for Proceeding

Direct trainees to disregard page 4-2 in the Student Workbook and to proceed to page 4-3 in the Workbook.

LEARNING RESOURCES

- **Videotape** Segment **4A:** Controlling Chemical Hazards Engineering Controls, Personal Protective Equipment
- Workbook Application Exercise **4A:** Working With Engineering Controls and PPE
- Videotape Segment 4B: Administrative Controls and Hazard Recognition
- Workbook Application Exercise 4B: Controlling Chemical Hazards Administrative Controls
- Lesson Summary

DIRECTIONS FOR PROCEEDING

Complete the following steps in order. You might want to check off each step as you complete it.

1) Read the workbook introduction to Videotape Segment **4A.**

2) Watch Videotape Segment **4A.**

___ *3)* Complete Application Exercise 4A in this workbook.

___ 4) Read the workbook introduction to Videotape Segment **4B.**

___ 5) Watch Videotape Segment 4B.

___ 6) Complete Application Exercise 4B in this workbook.

___ 7) Read the lesson summary.

TRAINER'S NOTES: Introduction to Videotape Segment 4A

Note: *Ask trainees to look at the videotape introduction on page 4-3 of the Student Workbook.*

Controlling chemical hazards often requires a combination of control methods. In this videotape segment, you'll see how one facility decided to use a combination of engineering controls and personal protective equipment to protect workers from the hazards associated with use of a corrosive cleaner.

■ As we watch this videotape, you should learn —

- what types of engineering controls are available and how each is used to help protect you;
- the difference between general and local exhaust ventilation and appropriate applications for each;
- how personal protective equipment is used to control both physical hazards and health hazards; and
- why proper selection and use of PPE is essential to your safety and health.

INTRODUCTION TO VIDEOTAPE SEGMENT 4A
Engineering Controls and Personai Protective Equipment

Controlling chemical hazards often requires a combination of control methods. In this videotape segment, you'll see how one facility decided to use a combination of engineering controls and personal protective equipment to protect workers from the hazards associated with use of a corrosive cleaner.

Notice the different types of engineering controls available to protect you from chemical hazards. Also watch for examples of how each type is used. Pay particular attention to the distinction between general and local exhaust ventilation, and learn to recognize appropriate applications for each. Then look for the types of personal protective equipment available to control both physical hazards and health hazards. Finally, learn why proper selection and use of PPE is essential to your safety and health.

Now, watch Videotape Segment 4A.

STUDENT WORKBOOK PAGE: 4-3

TRAINER'S NOTES: Application Exercise 4A

Ask trainees to turn to page 4-5 of their Student Workbook. Either lead the class through Application Exercise 4A as a group activity, or provide time for trainees to complete the exercise individually or in small groups. The answers and additional information given below appear on page 4-6 of the Student Workbook.

Answer		Additional Information
1)	A	Using steam cleaning instead of solvent-based cleaning
	B	Wearing chemical splash goggles
	A	Using a ventilation system to remove toxic dusts
	A	Complete enclosure of a sand blast operation
	B	Wearing a respirator to remove toxic vapors from your breathing air

Engineering controls include:

- ***SUBSTITUTION*** **—** replacing a hazardous chemical, process, or piece of equipment with a less hazardous one
- ***ISOLATION*** **—** using an enclosure, barrier, or distance to separate workers from hazards
- ***VENTILATION*** **—** **mixing** fresh air with contaminated air in a work area, or preventing **release** of airborne hazards by removing them at the source.

Personal protective equipment **(PPE)** includes eyewear, face masks, clothing, gloves, boots, and respirators — equipment that workers **wear** to prevent or reduce their exposure to hazardous chemicals.

2) C Substitution can be used to do any of the following

- Replace a hazardous ***CHEMICAL,*** such as lead-based pigment, with a less hazardous chemical, such as a non-toxic pigment.
- Replace a hazardous ***PROCESS,*** such as solvent-based cleaning, with a less hazardous process, such as steam cleaning.
- Replace a hazardous ***PIECE OF EQUIPMENT,*** such as a broom, which can create a dust hazard, with a more efficient piece of equipment, such as a wet vacuum cleaner.

Note: ***Direct trainees either to read the introduction to Videotape Segment*** 4B ***when finished, or to wait for further instructions. If time allows, ask the Optional Questions that begin on page 4-10 of this guide.***

APPLICATION EXERCISE 4A.
Working With Engineering Controls and PPE

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.

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1) Match the application with the type of control method.

Using steam cleaning instead of solvent-based cleaning	A) Engineering
Wearing chemical splash goggles	B) Personal Protective Equipment (PPE)
Using a ventilation system to remove toxic dusts	
Complete enclosure of a sand blast operation	
Wearing a respirator to remove toxic vapors from your breathing air	

2) Most paints no longer contain lead-based pigments because lead paint is a health hazard. What type of control is used when lead-based pigments are replaced by non-toxic pigments?

A) Isolation

B) Ventilation

C) Substitution

D) PPE

Now fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, Proceed to Videotape Segment 4B ***when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.***

STUDENT WORKBOOK PAGE: 4-5

TRAINER'S OPTIONAL QUESTIONS: Application Exercise 4A

01) Tell trainees: Using a high-speed orbital sander to get vehicles ready for painting produces a serious dust hazard.

List choices and ask: Which action is an appropriate example of a substitution control for this hazard?

A) Have workers wear dust masks instead of cartridge respirators.

B) Replace high-speed orbital sanders with sanders fitted with vacuum nozzles.

C) Change respirator filters when they get clogged with dust.

Answer: B

Sanders with vacuum nozzles control the dust hazard by capturing the dust before it becomes airborne. Replacing one type of sander with another is an example of controlling a hazard by substituting a more **efficient** piece of equipment. This could also be considered ventilation control since the vacuum introduces local ventilation which captures the dust at the source.

Dust masks provide less protection than other types of respirators, not more. Substituting a cartridge-type respirator for a dust mask might control an exposure hazard **better;** the reverse substitution would not.

Respirator falters do need to be cleaned or replaced periodically, but replacing an old falter with a new one does not introduce a new control method.

STUDENT WORKBOOK PAGE: No Reference

For questions 02 through 04, ***tell trainees:*** Mark uses a strong ammonium hydroxide cleaner to clean tile walls and ***floors. The*** cleaner comes in a spray bottle. To protect against the irritating liquid and vapor or gas, he uses a combination of controls.

02) ***Ask trainees:*** What type of control is Mark using when he opens the windows to provide a cross draft?

Answer: Ventilation

OPENING THE WINDOWS provides ***VENTILATION*** — fresh air to dilute the vapors in the room where Mark is working.

03) ***Ask trainees:*** **What** type of control is Mark using when he wears impervious gloves and splash goggles?

Answer: PPE

Any equipment you wear, such as ***GLOVES*** or ***GOGGLES, is PERSONAL PROTECTIVE EQUIPMENT — PPE.***

04) ***Ask trainees:*** What type of control is Mark using when he applies the cleaner with a sponge, rather than spraying it?

Answer: Process substitution

Mark ***SUBSTITUTED SPONGE*** application for ***SPRAY*** application. This change in process helps control the hazard by eliminating the formation of irritating mists.

STUDENT WORKBOOK: No Reference

O5) ***Tell trainees:*** A small dip painting operation in a large work area produces small amounts of a mildly irritating vapor that mixes readily with air.

List choices and ask: Which type of protective equipment is most appropriate for controlling this hazard?

A) General ventilation

B) Local exhaust ventilation

C) Air-supplied respirator

D) Air-purifying respirator

Answer: B Local exhuast ventilation

Local exhuast ventilation is most appropriate for controlling airborne hazards having the following characteristic

- Degree of hazard is low — airborne chemical is ***NOT very*** toxic (e.g., mild irritant), and airborne amounts are not great (e.g., dip painting).
- Airborne hazard mixes readily with air.

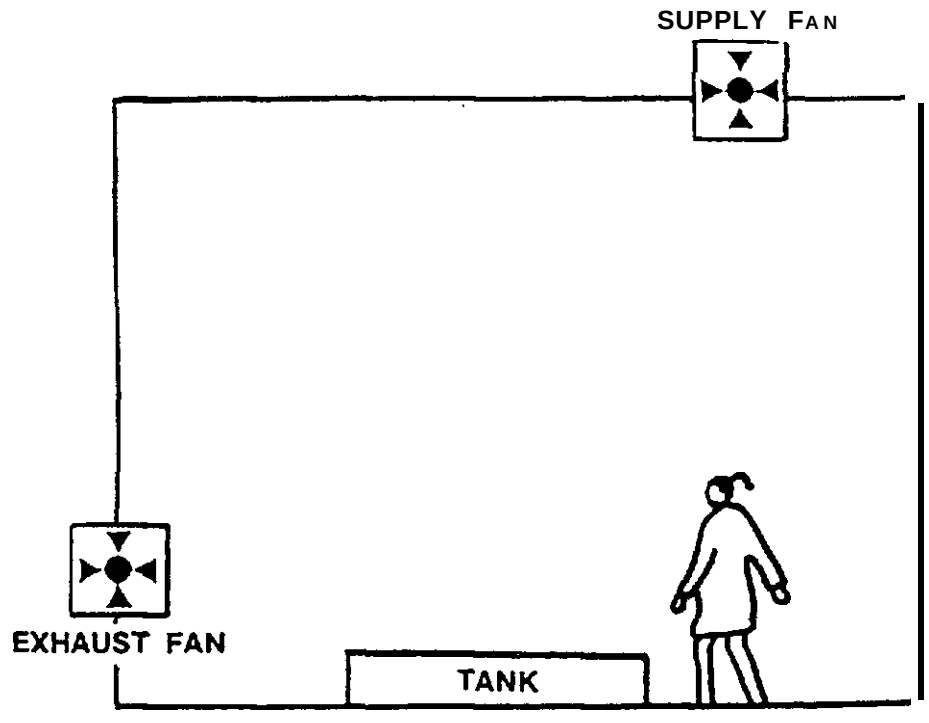
A large volume of air is needed for dilution; therefore local exhaust ventilation is better. General ventilation would require dilution and spreading throughout the shop.

Either local exhaust ventilation or respiratory PPE is required to control more serious exposure hazards.

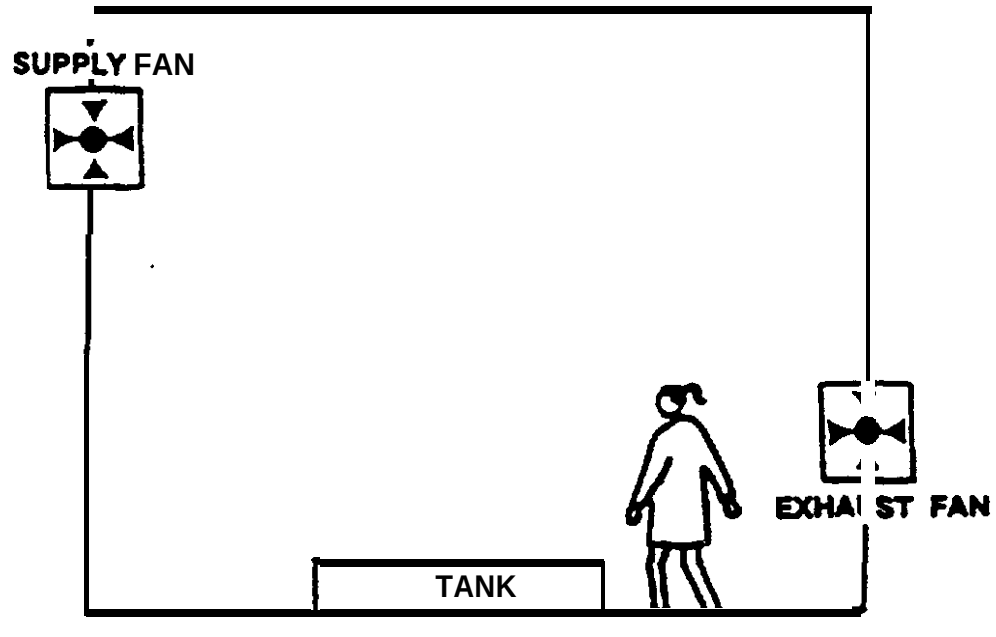
STUDENT WORKBOOK: No Reference

06) *Use the masters in the back of this book (Appendix E, pages E-n and E-12) to make an overhead of the follow ing pictures, or sketch the pictures on the chalkboard using stick figures.*

A)



B)



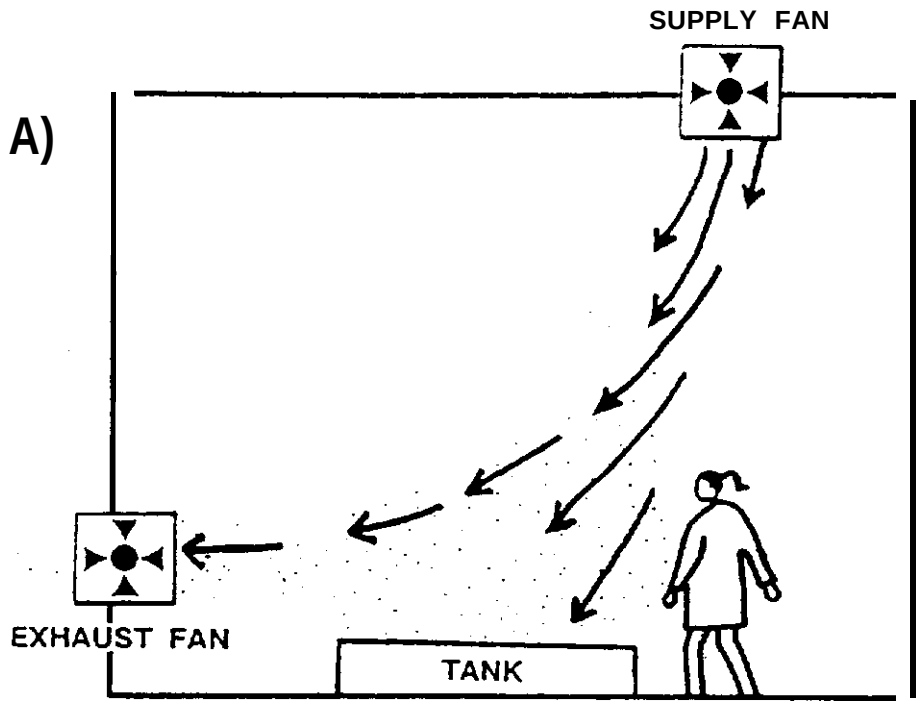
Ask trainees: Which picture shows the correct placement of the two **fans** used to provide general ventilation?

Answer: A

To protect you, a general ventilation system must dilute the contaminant in the workplace air **and** move the airborne hazard ***AWAY*** **from** you, not **pull** it toward **you.**

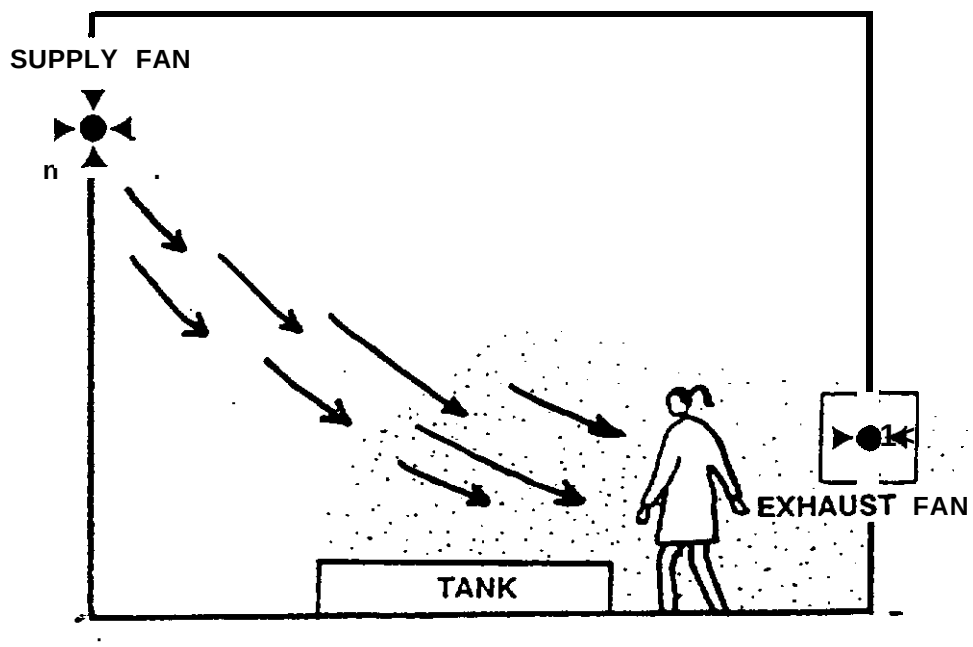
STUDENT WORKBOOK: No Reference

A)



RIGHT

B)



WRONG

07) *Use the master in the back of this book (Appendix E, pages E-n to E-12) to make an overhead illustrating different types of protective equipment, or bring in different types of protective eyewear and ask trainees to suggest appropriate applications for each.*

Answer:

ORDINARY SAFETY GLASSES protect best against eye **injury caused by** impact or **projectiles,** such as flying particles. This type of protection is required when operating a tablesaw.

Even with side shields, **safety** glasses do ***NOT*** provide a sealed barrier against liquid chemicals, **If a** splash could cause serious eye injury, you need splash goggles and a **full** face shield.

CHEMICAL SPLASH GOGGLES keep liquids out of the eyes. This type of eyewear protects against splashes.

FACE SHIELDS protect both the face and eyes. These devices may be used alone or in conjunction with other protective eyewear such as safety glasses and chemical splash goggles, depending on the chemical and physical hazard to be encountered.

GAS-PROOF GOGGLES keep gases, vapors, mists, fumes, and dust out of the eyes.

“”

STUDENT WORKBOOK: No Reference

List the two types of respiratory protection (A ***and B) on the chalkboard and then ask questions 08 through 011 .***

A) **Air-purifying** respirator B) Air-supplied respirator

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08) What type of protection does Jerry need when he descends into a storage tank where there is very little oxygen?

Answer: B; Air-supplied respirator

Jerry needs **an *AIR-SUPPLIED RESPIRATOR*** because he is entering an area that lacks the oxygen he needs to live. Only air-supplied respirators supply oxygen.

09) **What type** of protection does Al need when he sprays an insulating foam containing highly toxic **isocyanates?**

Answer: B; Air-supplied respirator

Al needs an ***AIR-SUPPLIED RESPIRATOR*** because he is working with a highly toxic material. Breathing even a little **isocyanate** could seriously injure him. The risk of this happening is much greater with an **air-purifying** respirator

010) **What** type of protection does Liz need when she uses a vacuum to cleanup a small amount of mercury spilled in a plant that makes communications gear?

Answer: A; Air-purifying respirator

Liz can use an ***AIR-PURIFYING RESPIRATOR*** to remove mercury vapors from the air she breathes. She could also wear an air-supplied respirator, but this probably isn't necessary,

STUDENT WORKBOOK PAGE: No Reference

011) What type of protection does Marge need when she uses a power tool to sand paint off outdoor stairs?

Answer: A; Air-purifying respirator

Sanding painted surfaces produces paint dust, which is a health hazard. Because she is working outside, Marge has a natural, generai ventilation system to dilute the hazard. Thus, the right type of ***DUST MASK may suffice.***

O12) ***Read each statement below and poll the class on whether it is true or false. Invite someone who answers correctly to explain the correct answer.***

(T) PPE only protects the worker who wears it.

0?) If a rubber glove works, so will a plastic glove.

(F) Proper fit is only important for respirators.

Answer: T(rue)

PPE is *PERSONAL* protection. It protects only the person who wears it AND uses it correctly.

The glove *MATERIAL* must be selected to match the specific hazard. Like skin, the same glove material can be a barrier for some liquids and not for others. A solvent that can't get through rubber might pass through a plastic glove — or dissolve it.

All PPE must fit properly. Proper fit is critical for respirators because a leaky facemask allows the wearer to breath the airborne hazard. Although an oversized glove may still prevent skin contact, it also hinders dexterity. This hazard can cause an accident that results in injury or exposure to a health hazard.

STUDENT WORKBOOK PAGE: No Reference

013) ***Tell trainees:*** Peter wears an **air-purifying** respirator to prevent **exposure** to toxic mists and vapors in a spray-painting operation. While wearing a respirator one day, he starts smelling an odor like turpentine.

List choices and ask: **What** could have happened?

A) Peter's respirator needs anew filter or cartridge.

B) Peter's respirator ran out of oxygen.

C) Peter started growing a beard.

D) Peter borrowed someone else's respirator.

Answer: A, C, D

A respirator is intended to prevent you from breathing a hazard. Because Peter can smell the hazard, he is breathing it. Thus, his respirator is not fully protecting him.

An air-purifying respirator contains a falter or cartridge that removes airborne hazards from the air. No filter or cartridge lasts forever, All respirators require proper maintenance to work correctly.

Respirators must also **fit** properly. The seal between the skin and the **facemask** must be airtight. Facial hair can make gaps in the seal that allow airborne hazards to enter the facemask and get into the lungs.

Because every face is different, everyone's respirator must be individual.Iy fitted. Never assume that a borrowed respirator will **fit** properly or that it will provide the protection needed.

STUDENT WORKBOOK PAGE: No Reference

TRAINER'S NOTES: Introduction to Videotape Segment 4B

Note: ***Ask trainees to look at the videotape introduction on page 1-2 of the Student Workbook.***

Administrative or procedural controls are also used to protect you from chemical hazards.

■ As we watch this videotape, notice how chemical hazards are controlled through —

- information and training,
- safe work practices;
- good housekeeping and personal hygiene; and
- environmental, personal, and medical monitoring.

■ Also watch for ways that you can help reduce injury and illness by recognizing and reporting uncontrolled chemical hazards.

INTRODUCTION TO VIDEOTAPE SEGMENT 4B: Administrative Controls

In addition to engineering controls and Personal Protective Equipment, controlling chemical hazards requires information and training, safe work practices, good housekeeping, good personal hygiene, and monitoring. As you watch this videotape, look for examples of each of these administrative controls.

Also pay close attention to ways that you can help to control chemical hazards. Notice how a simple change in work practices can reduce or eliminate an exposure. See why it's important to report any medical symptoms you may experience, And be alert for ways of using your senses to detect potential hazards.

Now, watch Videotape Segment 4B.

STUDENT WORKBOOK PAGE: 4-7

TRAINER'S NOTES: Application Exercise 4B

Ask trainees to turn to page 4-9 of their Student Workbook. Either lead the class through Application Exercise 4B as a group activity, or provide time for students to complete the exercise individually or in small groups. The answers and additional information given below appear on pages 4-10, 4-12, and 4-14 of the Student Workbook.

Answer	Additional Information
1) A	A simple change in work practices and good personal hygiene can often help to control your exposure to a chemical hazard, For example: . Changing your position so you breathe less vapor . Washing your hands before eating or drinking • Handling volatile materials in a chemical laboratory hood . Covering or capping chemical containers when not in use
2) C	The goal of housekeeping is to contain and remove hazards, and requires the following • Proper storage and handling • Proper clean-up procedures • Prompt removal and correct disposal of chemical wastes Local ventilation captures chemical hazards at the source. General ventilation mixes and dilutes the hazard with air. PPE and isolation put barriers between people and hazards.
3) B D	Reporting medical symptoms that may be caused by exposure to a health hazard in your work area tells your supervisor that — . an exposure hazard may exist; and . you are on the alert for potential hazards. Experiencing medical symptoms does NOT necessarily mean that the exposure is caused by your work practices, but it could be. Nor does it necessarily mean that medical monitoring is required. It DOES means that a hazard MAY exist, and that this potential hazard should be evaluated and, if necessary, controlled.
Note:	***You may wish to discuss the importance of reporting medical symptoms. Ask the trainees why this is important and what it tells the supervisor. Have them think about what is normal (sneezing from a cold) and what is job-related (sneezing from excessive dust exposure).***

APPLICATION EXERCISE 4B:
Administrative Controls and Hazard Recognition

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. Remember, them maybe more than one correct choice for a question. When you complete the exercise, fold over the right side of thepage to check your answers. Then turn the page to get more information about each question.

1) Can a change in work practices help to control a chemical hazard?

A) Yes

B) No

2) How does good housekeeping help to control chemical hazards?

A) Capturing the hazard as it forms at the source

B) Mixing and diluting the hazard with air

C) Containing and removing the hazard

D) Putting a barrier between an individual worker and the hazard

3) Suppose you report exposure symptoms to your supervisor. What does this tell your supervisor?

A) You use sloppy work practices.

B) An exposure hazard may exist.

C) Routine medical monitoring is required.

D) You're on the alert for potential hazards.

STUDENT WORKBOOK PAGE: 4-9

TRAINERS NOTES: Application Exercise 4A

Answer	Additional Information
4)	*Read each statement and poll trainees on whether they think it is true or false. Ask someone who responds correctly to explain.*
(F)	I'll always be able to see, smell, or taste an exposure hazard.
(T)	Most airborne hazards can ***NOT*** be seen.
(F)	If a smell disappears, I am no longer breathing the chemical.
(T)	Monitoring may be required to detect hazardous exposures, even if the chemical has a strong odor.
(T)	Any chemical I can smell or taste is entering my body.

You cannot sense odorless, colorless, tasteless gases like carbon monoxide. Although you can see bulk solids and liquids, airborne forms are often invisible.

You can smell or taste some airborne hazards, But remember, anything you can smell or taste is also entering your body. Also remember that your sense of smell is limited.

You may not be able to smell the very small amounts of an airborne hazard that can harm you. Some chemicals also deaden your sense of smell — the smell disappears even though you're still breathing the hazard.

4) Label each statement either true or false.

I'll always be able to see, smell, or taste an exposure hazard.

Most airborne hazards can NOT be seen.

If a smell disappears, I am no longer breathing the chemical.

Monitoring may be required to detect hazardous exposures, even if the chemical has a strong odor.

Any chemical I can smell or taste is entering my body.

STUDENT WORKBOOK PAGE: 4-11

Answer **Additional Information**

5) ***Read each clue andpoll trainees whether or not they think it can alert someone to an uncontrolled hazard. Ask someone who responds correctly to explain.***

(Y) Drop in noise level near a ventilation system

(Y) Abnormal reading on a gas or vacuum gauge

(N) Worker with a cold sneezing

(Y) Liquid being used up more quickly than usual

(Y) Sound of a near-by explosion

(N) Maintenance worker vacuuming

(Y) Sudden build-up on exhaust vents

(Y) Unusual smell

(T) Burning sensation

Anything unusual may alert you to a potential hazard —

- Drop in noise level
- Abnormal gauge or meter readings
- Using up a material more quickly or slowly than usual
- Sounds associated with accidents or emergency situations, such as explosion or fire
- Changes in the way equipment or materials look
- An odor you don't normally smell
- A sensation you don't normally feel

6) A C Medical monitoring helps to detect uncontrolled and improperly controlled exposure hazards. When a medical exam or lab test indicates an exposure problem, a hazard exists. Identifying, evaluating, and controlling this hazard prevents repeated exposure. Sometimes, it can also prevent occurrence of more serious health effects that develop slowly over time.

Immediate health effects appear while you are being exposed, ***or*** shortly thereafter. Medical monitoring itself cannot prevent occurrence of immediate symptoms or subsequent long-term health effects.

5) Which of the following clues alert you to a potential, uncontrolled health hazard?

Drop in noise level near a ventilation system

Abnormal reading on a gas gauge

Worker with a cold sneezing

Liquid being used up more quickly than usual

Sound of a near-by explosion

Maintenance worker vacuuming

Sudden build-up on exhaust vents

Unusual smell

Btig sensation

6) Regina routinely handles mercury, a liquid that can buildup in the body over time and can cause irreversible brain damage, How could medical monitoring help protect Regina?

A) Detect uncontrolled exposure **hazards**

B) Prevent occurrence of immediate exposure symptoms

c) Prevent irreversible brain damage

D) None of the above

Now go back to page 4-9, fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, proceed to the Lesson Summary when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.

STUDENT WORKBOOK PAGE: 4-13

Note *Direct trainees either to proceed to the Lesson Summary when finished, or to wait for further instructions. If time allows, ask the Optional Questions that begin on page 4-36 of this guide.*

STUDENT WORKBOOK: No Reference

O1) ***Read each control and ask trainees to identify it as an Administrative (A), Engineering (E), or Personal Protective Equipment (PPE) cent.d.***

(E)	Substituting silicon/bronze weMing for lead-based soldering
(A)	Requiring written hazard information and training
(E)	Installing a ventilation system
(A)	Using good work practices
(A)	Monitoring exposure levels
(A)	Storing chemicals properly
(PPE)	Wearing protective gloves and goggles
(A)	Removing chemical wastes for proper disposal

Answer: Administrative controls include the **following:**

- ***DOCUMENTATION, INFORMATION, AND TRAINING*** — **SUCh as warning labels,** MSDSS, Inventory, and Hazard Communication Programs
- ***SAFE WORK PRACTICES***
- ***HOUSEKEEPING*** — containing and removing chemical wastes; proper handling, storage, and waste disposal
- ***MONITORING*** — environmental, personal, and medical*

Substituting one chemical or process for another is **an** engineering control. Ventilation is also an engineering control,

Gloves and goggles **are** personal protective equipment,

Note:** ***Medical monitoring may provide an alert that an uncontrolled hazard exists, but it may not be used as a control measure because it shows an effect that has already occurred to the body.

STUDENT WORKBOOK. No Reference

02) Which type of administrative control(s) can be used to check the effectiveness of other controls?

Answer: Monitoring

MONITORING is the administrative control used to check the effectiveness of other controls.

03) ***Ask trainees to list examples of monitoring.***

Answer: Environmental/Area, Personal, Medical

There are three types of monitoring.

. *ENVIRONMENTAL* or area monitoring samples air or work surfaces to check environmental levels of contamination in the workroom air, which could present potential exposure hazards.

• *PERSONAL* monitoring uses badges or other devices to measure an individual's level of exposure to potential hazards.

• *MEDICAL* monitoring uses baseline and periodic physicals and laboratory tests to diagnose exposure problems.

Note: ***Medical monitoring may provide an alert that an uncontrolled hazard exists, but it may not be used as a control measure because it shows an effect that has already occurred to the body.***

04) ***Tell trainees:*** Matt often has a headache by the end of the day but doesn't want to get labeled a complainer. Suppose he asks you: "Do you think I should tell my supervisor?"

List choices and ask trainees: Which questions are helpful in giving Matt advice?

A) Do you work with chemicals that can cause headaches?

B) Is anyone else in your area getting headaches?

c) Does it go away if you take aspirin?

D) Do you get headaches on your days off?

Answer: A, B, D

STUDENT WORKBOOK: No Reference

Many of the immediate health effects produced by chemical hazards are commonplace. Headaches, nausea, dizziness, and so on have many different causes. The following clues often help to identify work-related adverse health effects.

. Person works with a chemical that can cause the symptom.

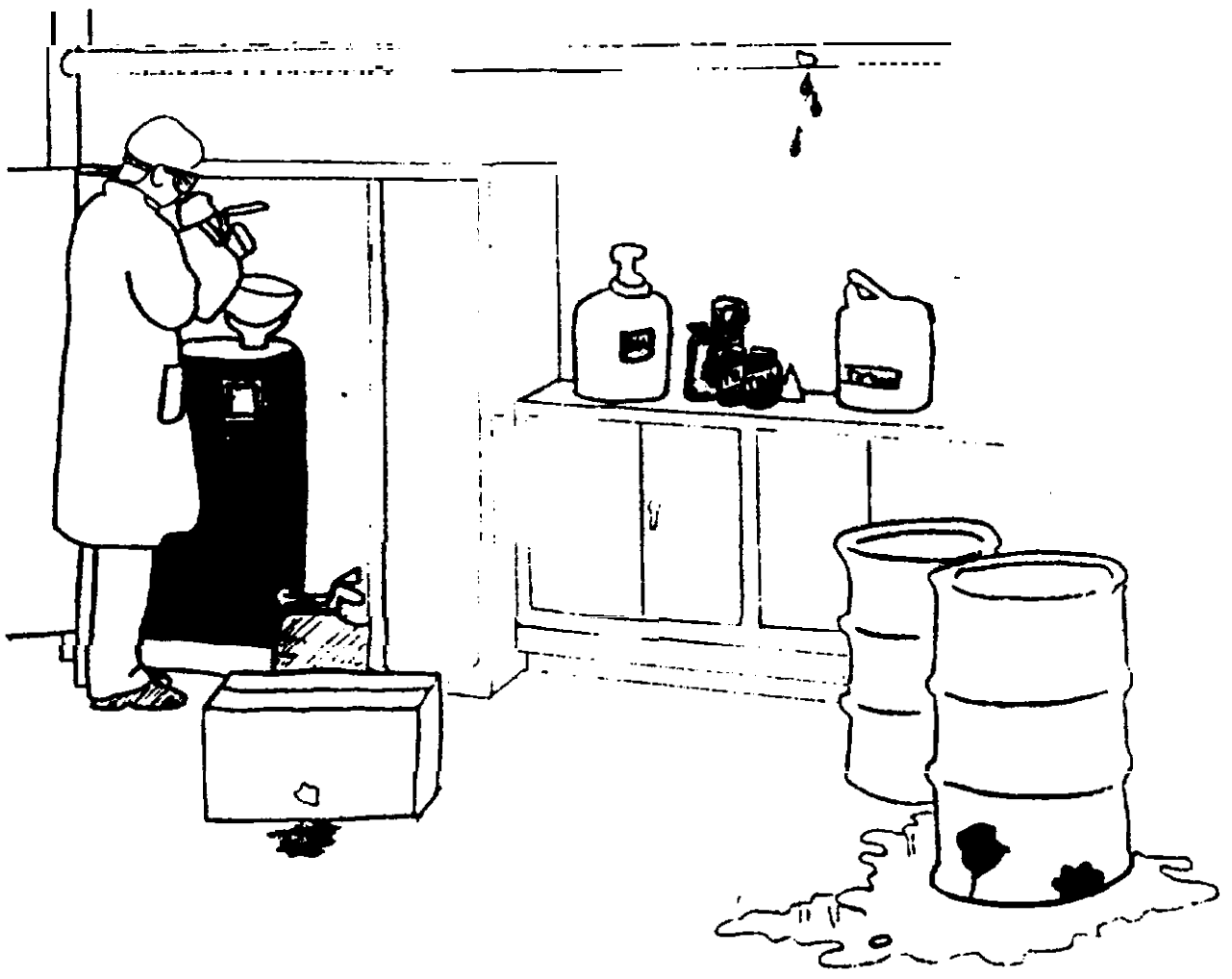
. The other workers in the area have the same symptom.

- The symptom appears while at work and gets better or disappears during time off. In some cases, such as nitroglycerine exposure, symptoms will get worse after leaving work because of withdrawal from the work exposure.

  Like any other headache, one caused by exposure to a workplace chemical may go away if aspirin is taken. But be aware that taking aspirin does not control the hazard — it just makes the immediate symptom go away.

O5) ***Use the masters in the back of this book (Appendix E, pages E-9 and E-10) to make overheads or handouts of the following pictures.***

Ask trainees: **What** hazards should be reported?

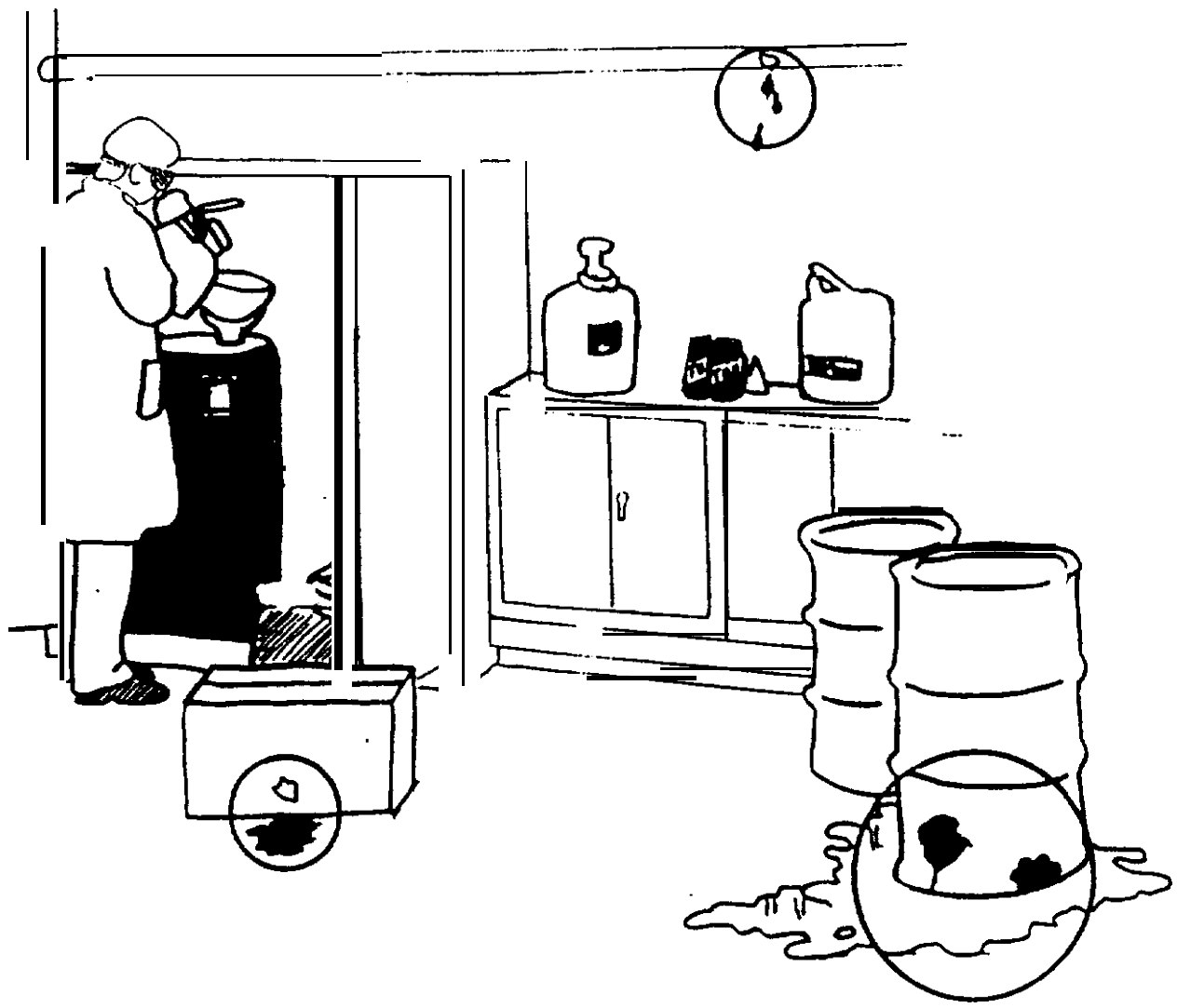


STUDENT WORKBOOK: No Reference

STUDENT WORKBOOK: No Reference

O5) *(Continued)*

Answer: Damaged container, leaking pipe, and spill (circled in picture).



Rusted, dented, or otherwise **damaged** chemical containers are **always potential hazards. Chemical** leaks and **spills allow** chemicals to escape and **always** present a potential exposure hazard.

STUDENT WORKBOOK No Reference

TRAINER'S NOTES: Review of Videotape Segment 4A

If time permits, review and reinforce the learning objectives by asking the following open-ended questions answered in the Summary. Draw attention to the Summary in the Student Workbook for future reference.

Q1) What are the three basic methods of controlling chemical hazards?

Answer: There are three basic methods of controlling chemical hazards.

- Engineering controls
- Personal Protective Equipment (PPE)
- Administrative controls

Q2) What are the four types of engineering controls? (List, define, and give an example of each.)

Answer: ***ENGINEERING CONTROLS*** include the following

- ***SUBSTITUTION*** — replacing a chemical, process, or piece of equipment with a less hazardous or more efficient one.

  Example: steam instead of solvent cleaning

- ***ISOLATION*** — using an enclosure, barrier, or safe distance to separate workers from exposure hazards.

  Examples: machine enclosures, enclosed control rooms, splash guards

- ***GENERAL VENTILATION*** — mixing an airborne hazard with fresh air to reduce exposure levels; this is only suitable for hazards of low toxicity that mix readily with air.

  Examples: fans, make-up air vents

. ***LOCAL EXHAUST VENTILATION*** — capturing an airborne hazard as it is released and taking it out of the workplace to eliminate exposure.

  Examples: hoods, slots, and dust collectors

LESSON 4 SUMMARY

There are three basic methods of controlling chemical hazards.

- Engineering controls
- Personal Protective Equipment (PPE)
- Administrative controls

ENGINEERING CONTROLS include the **following:**

- ***SUBSTITUTION*** — replacing a chemical, process, or piece of equipment with a less hazardous or more **efficient** one.

  Example: **steam** instead of solvent cleaning

- ***ISOLATION*** — using an enclosure, barrier, or safe distance to separate workers from exposure hazards.

  Examples: machine enclosures, enclosed control rooms, splash guards

- ***GENERAL VENTILATION*** — mixing an airborne hazard with fresh air to reduce exposure **levels;** this is only suitable for hazards of low toxicity that mix readily with air.

  Examples: fires, make-up air vents

- ***LOCAL EXHAUST VENTILATION*** — capturing an airborne hazard as it is released and taking it out of the workplace to eliminate exposure.

  Examples: hoods, slots, **and** dust collectors

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Q3) How does personal protective equipment work?

Answer: ***PERSON&PROTECTIVE EQUIPMENT*** puts a barrier between the hazard and the individual who wears it. It can protect against both physical hazards and health hazards.

Q4) **What types** of PPE are used to protect against —

. physical hazards, such as **fire?**

• eye and skin contact/absorption hazards?

• inhalation hazards?

• lack of oxygen?

Answer: ***PERSONAL PROTECTION EQUIPMENT*** includes

• *PROTECTI'VE CLOTHING* (physical hazards, contact/ absorption hazards).

Examples: hats, hoods, boots, impervious gloves, rubber gloves, rubber aprons, lab coats, impervious boots, impervious suits.

. ***EYE AND FACE PROTECTION*** (physical hazards, contact/absorption hazards)

Examples: safety glasses, splash goggles, gas-proof goggles, face masks and shields.

• ***AIR-PURIFYING RESPIRATORS*** (inhalation hazards)

Examples: respirators with a cartridge or falter that removes contaminants from the air you breathe.

. ***AIR-SUPPLIED RESPIRATORS*** (inhalation hazards, lack of **oxygen)**

Examples: self-contained units that supply air from a tank carried on the **back;** air-line units that provide air from a remote source.

Q5) What factors are critical when relying on PPE to protect yourself from chemical hazards?

Answer: Selection, proper fit, correct use and maintenance

To protect someone, PPE must be matched to the specific hazard. For example, cloth gloves are useless for protection against a corrosive liquid. PPE is also useless unless workers wear it. Proper fit, correct use, and routine maintenance are also critical.

PERSONAL PROTECTIVE ***EQUIPMENT*** puts a barrier between the hazard and the individual who wears it. It can protect against both physical hazards and health hazards.

- ***PROTECTIVE GLOVES AND CLOTHING***

  Examples: hats, hoods, boots, impervious gloves, cloth gloves, rubber aprons, lab coats, impervious boots

- ***EYE AND FACE PROTECTION***

  Examples: safety glasses, splash goggles, face masks and shields

- ***AIR-PURIFYING RESPIRATORS***

  Examples: Respirators with a cartridge or filter that removes contaminants from the air you breathe

- ***AIR-SUPPLIED RESPIRATORS***

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To protect you, PPE must be matched to the specific hazard. For example, cloth gloves are useless for protection against a corrosive liquid. PPE is also useless unless you wear it. Proper fit, correct use, and routine maintenance are also critical.

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TRAINER'S NOTES: Review of Videotape Segment 4B

Ql) **What are** the four different types of administrative controls? (List, define, and give examples of each.)

Answer: ***ADMINISTRATIVE CONTROLS*** include the **following:**

. ***DOCUMENTATION, INFORMATION, AND TRAINING***

Examples: warning labels, **MSDSs,** Hazardous Chemical Inventory, written Hazard Communication Program

• ***WORK PRACTICES***

Examples: using **all** available controls correctly, reporting uncontrolled hazards promptly

• ***HOUSEKEEPING*** — containing and removing hazards

Examples: vacuuming toxic dusts, proper storage and handling, correct disposal of chemical wastes

. ***MONITORING*** — checking the effectiveness of other controls

Examples: air and wipe samples for area monitoring, personal sampling for individual monitoring, medical exams and laboratory tests

Q2) How can you detect uncontrolled chemical hazards in your work area?

Answer: Using your senses, spotting equipment failures, spotting emergency/ accident situations, recognizing health effects, watching for anything **unusual.**

Always be alert for uncontrolled chemical hazards in the workplace. Bulk liquids and solids are visible, but most airborne hazards are invisible. Workers **can** smell or taste some airborne chemicals, but not others. Some chemicals deaden the sense of smell, and others cannot be detected by smell at the very low levels that are harmful. Remember, anything we smell or taste is entering the body.

In addition to sensing the chemical itself, you can detect exposure hazards by

. Spotting equipment failures — a ventilation system that stops working, damaged chemical containers, faulty **PPE.**

• Spotting leaks, spills, **fires,** explosions, uncontrolled chemical reactions, or other emergency/accident situations.

• Recognizing health effects produced by exposure, such as headache, dizziness, coughing, irritation, or nausea

• Watching for anything unusual or out of the ordinary.

LESSON 4 SUMMARY

ADMINISTRATIVE CONTROLS include the following

- ***DOCUMENTATION, INFORMATION, AND TRAINING***

  Examples: warning labels, MSDSS, Hazardous Chemical Inventory, written Hazard Communication Program

- ***WORK PRACTICES***

  Examples: using all available controls correctly, reporting uncontrolled hazards promptly

- ***HOUSEKEEPING — containing*** and removing hazards

  Examples: vacuuming toxic dusts, proper storage and handling, correct disposal of chemical wastes

- ***MONITORING —*** checking the effectiveness of other controls

  Examples: Air and wipe samples for area monitoring, personal sampling for individual monitoring, medical exams and laboratory tests

Always be alert for uncontrolled chemical hazards in your workplace. You can see bulk liquids and solids, but most airborne hazards are invisible. You can smell or taste some airborne chemicals, but not others. Some chemicals deaden your sense of smell, and others cannot be detected by smell at the very low levels that can harm you.

Remember, anything you smell or taste is entering your body.

In addition to sensing the chemical itself, you can detect exposure hazards by doing the following

- Spotting equipment failures — a ventilation system that stops working, damaged chemical containers, faulty PPE
- Spotting leaks, spills, fires, explosions, uncontrolled chemical reactions, or other emergency/accident situations
- Recognizing health effects produced by exposure, such as headache, dizziness, coughing, irritation, or nausea
- Watching for anything unusual or out of the ordinary.

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